we may add Chauveau and Steele] this has been confounded with the spigelian lobe of man."

In conclusion, we are sure that all teachers of anatomy will agree that, in an educational point of view, Mr. Steele's volume is a most valuable addition to the literarature of the subject on which he treats.

#### OUR BOOK SHELF

Dutch Guiana. By W. G. Palgrave. (London: Macmillan and Co., 1876.)

Canoe and Camp Life in British Guiana. By C. Barrington Brown, Assoc.R.S.M. (London: Stanford, 1876.)

THESE two works deal with a small portion of a region of considerable interest from various scientific points of view, but of which we as yet know comparatively little: indeed much of the region included under the name Guiana is a terra incognita, and presents a fine field for an enterprising explorer. Mr. Palgrave, whose long silence since the publication of his classical work on Arabia many have wondered at and regretted, spent only a fortnight in Dutch Guiana, and this volume testifies made a diligent use of his time. The work is more connected with the historical, social, and commercial aspects of the Dutch colony than with the strictly scientific, but contains much valuable information about a country of which even the Dutch themselves, we suspect, know little. Mr. Palgrave has gathered many facts about the colony from various quarters, and ingeniously weaves these into his pleasant narrative, so that a reader who gets to the end of the little volume will have a very fair idea of its history, present condition, and future prospects. In a graphic and popular way he describes the journeys he made up the rivers near the coast, and conveys a fair idea of the productions, the people, and the aspect of the district visited. To the ethnological reader, one of the most interesting chapters is that on the Bush Negroes. Scattered all over the colony to the number, Mr. Palgrave thinks, of about 30,000, are various tribes of independent negroes, descendants of former slaves, who rose against their Dutch masters, fought for and obtained their freedom and liberty to settle pretty much where they chose, and have lived peaceably beside their former masters ever since. These Bush Negroes are descended mostly from Africans of the same type, but are now divided into three main tribes, and several subordinate branches, with chiefs and sub-chiefs, each tribe named from the place at which its treaty of peace and freedom was signed, as Aucan, Saramaccan, and Moesinga. The interesting point is that "the grouping, once made, perpetuated, and in the course of years it has produced in each instance a distinct type, till what was at first merely nominal and accidental has become permanent and real." Mr. Palgrave's work is one of great interest from beginning to end. It contains a clear map and a plan of Parimaribo.

Mr. Brown is a much better surveyor and explorer than he is a book-maker. As Government Surveyor of British Guiana, he has visited nearly every corner of it—the tracings of his routes on the map forming a regular network of blue lines—and during his journeys has collected a vast amount of valuable information about its physical aspect, geology, fauna, flora, and people. The reports on the physical features and descriptive geology of the colony have, he says, been already published by the Treasury Commissioners, and in the present volume he professes to give only a popular narrative of his travels. But the volume is something more than this, as almost every page contains notes on the fauna and flora and geological features, as well as natives that came under his observation. All these notes are put down miscellaneously in the order of time, amid the notes of the

incidents that occurred during the journeys, so that it is difficult for one interested in the natural history of the country to ferret out and classify the observations. Mr. Brown would have done great service both to the general and the scientific reader, had he gathered these notes together and arranged them in an appendix, or even if he had taken care to see that his work was provided with a carefully compiled index. In another edition we hope the latter want will be supplied, as it will certainly add much to the value of the work, which, notwithstanding the defects in plan we have mentioned, is an important contribution to the information we already possess about British Guiana. Mr. Brown, it may be remembered, was the discoverer of the magnificent Kaieteur Fall, on the river Potaro, a tributary of the Essequibo, an account of which we gave in NATURE shortly after its discovery in 1870 (vol. iii. p. 108). The excellent map and well-executed illustrations add much to the interest and value of Mr. Brown's work.

The Royal School of Mines' Magazine. (London: Wyman and Sons, 81, Great Queen Street, Lincoln's-Inn Fields, W.C.)

THIS magazine, the first number of which we have just received, is to be issued three times a year, under the auspices of the students of the Royal School of Mines, and is to be devoted to articles on travel, athletics, football, and to other matters connected with the school. The present number contains several articles, by former students, on travel, an article on football, together with a record of matches played by the Royal School of Mines' Football Club, during the session 1875-76. It also contains a list of papers on mining and metallurgy; results of Royal School of Mines for 1875-76; a report of the annual dinner of the club; besides two original poems, both of which are good.

We confess we are a little disappointed that greater attention has not been paid to scientific subjects; we have no doubt, however, that this will be rectified in future, and we heartily recommend the magazine to all interested in the Royal School of Mines. J. McD. C.

## LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

# Storm Waves of Cyclones

I BEG to submit the following suggestion, to explain in a general way by the accompanying diagram the view that might be teken of the rise and great height of storm waves of cyclones at sea, such as occurred in the Bay of Bengal, and inundated and devastated extensive tracts of the coasts and islands on October 31 and November 1, 1876.

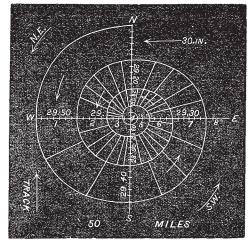
It is generally observed that when the winds blow into a reentering angle of any sea-walls or quays, that the surge of the wave rises higher in it than against the plane sea wall, and frequently it shoots up the corner in a kind of spouting form. Again, the tides in estuaries and friths, having bell-shaped mouths facing the ocean, and contracted inner ends receiving a river, rise to very extraordinary heights, as in those of the Severn and Thames, where disastrous floods have just occurred.

These heights are much increased when the winds blow into them, as westerly into the Severn estuary, and easterly into the Thames mouth, as during the recent gales. The ordinary rise on the south coast of England of the tides is generally only about ten feet, but at Bristol they may rise to thirty or forty feet, which, in fact, would be greater than the height of any storm-wave in a cyclone in India. Now if the course of the revolving winds in a storm mass be considered as a spiral from the outside to the inside, like a coiled watch-spring, then the section of each spiral turn may be considered as decreasing from the outside to the centre inside. This will therefore resemble a long re-entering angle or estuary tube twisted upon itself as a

helix, and therefore if the water be driven in at the large end and up to the small end of the spiral, it should considerably in-

crease in height as it went along and move with greater rapidity.

When arrived at the extremity of the spiral, it may be considered to remain there for some time and spread itself out laterally in bulk at the high level as long as the violence of the storm lasted. But when the force of the wind began to diminish, this heaped aqueous mass would more or less suddenly subside,



Cyclone-Horizontal Plan.

and rush down on all sides to seek its natural level. might occur at sea, and be evidenced by the long swell or rollers frequently seen, or might be translated by progressive motion to launch its tremendous weight on the land, and inundate it. This, it may be conjectured, could only be effected over lands about the level of the sea, over which the base of the funnel of the cyclone would advance, carrying the inclosed mass of water with it for part of the area of the revolving circle, which would so far be still able to draw its supplies from the sea on the coast yet included in its motion. As soon, however, as the southern or equatorial limb of the circle had so far progressed as to leave the sea behind it, then the friction of the earth would prevent the inclosed mass of water following the cyclone, which had been already cut off from its aqueous communication, and it would be left behind to expand over and deluge the country lying under its level.

In speculating on the dimensions of the Bengal storm-wave we may assume, from the statements in the newspapers, that it was a disc of fifty miles in diameter and twenty feet deep, when viewed

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[Cyclone-Vertical Section.

as a frustrum of a cylinder, which might also represent, when in a state of gyration, a cone of the same diameter and forty feet high in the centre. The contents of this space would amount to about, in bulk, 1,094,785,668,000 cubic feet, representing a weight of 70,339,979,169,000 lbs of sea-water, which would have flooded over a perfectly level district of a disc of about 700 miles in diameter, or 39,270 square feet in area to the depth of one foothorizontally.

The means for counteracting the disastrous effects of the storm or cyclone-wave in the Delta of the Ganges on life and property, would probably be found in the erection of mounds, as proposed by a writer in the Times. As this tract of country would be destitute of stone or rock, and be composed chiefly of mud and sand, it would be requisite to convert this into bricks first, as the mud-mounds would not stand the impact of the storm-waves. even in this country.

The design for the construction of these mounds would probably be most suitable after the model of the celebrated Tower of Babel, projected by the post-Diluvial inhabitants of Mesopotamia for a like purpose of self-preservation from inundation.

VORTEX

### "Polar Cyclones"-Etna Observatory

In reply to Mr. Clement Ley's letter in NATURE, vol. xv. p. 253, I fear I cannot at all agree with him as to the cause of the polar depressions of the barometer. He says: "The 'polar cyclones' appear to be themselves aggregates of those local depressions, or cyclones, which have penetrated into the Arctic or Antarctic regions, and have there partially or wholly coalesced." Now, let us test the question in this way:—Suppose the surface of our planet were all land, so that there was no watery vapour in the atmosphere; there would be no cyclonic storms, for they are due to what Espy truly calls steam power; -- would the polar depressions of the barometer be observed as they are in our actual atmosphere? Mr. Clement Ley's reasoning seems to require him to say that they would not; I have no doubt that they would. The causes which produce the west winds of the middle latitudes (Maury's "counter-trades") would act as in our actual atmosphere, and their centrifugal force, in rotating round the poles, would produce a space of shallow atmosphere at and around each pole, exactly like the depression at the centre of a vortex of water, which would show itself, as at present, by a depression of the barometer.

I see in NATURE of the same date that it is proposed to form a meteorological observatory on Etna. I hope the opportunity may be taken of obtaining what is one of the greatest desiderata in the present state of meteorology-I mean a set of comparative observations of the barometer taken at two neighbouring stations, one at the sea-level, and the other at a great height. One such set, continuous or taken at short intervals, extending over a few years, and accompanied by observations of temperature and wind (the latter by self-registering anemometers), would probably give more information on the physics of barometric waves than could be obtained by any amount of observations, all taken at the sea-level. I have urged this in NATURE before, but it is so

important I hope I may do so again.

Joseph John Murphy Old Forge, Dunmurry, Co. Antrim, January 20

### The Boomerang

REFERRING to my letter on the "Boomerang" which you were so good as to publish in NATURE, vol. xiv. p. 248, I may, perhaps, be permitted to add a few more statements on the same subject. Concerning the use of the boomerang by the North Gippsland aboriginal natives, I have no more to add, but I have acquired some information in respect to its use among the blackfellows of South Australia, which may be of interest.

My informant is Mr. James, now a senior con-stable in the Victorian police, but formerly, and when I first became acquainted with him, managing a large cattle station at Blanchewater, on the borders of the so-called Lake Torrens Basin. Mr. James has had great experience among the blacks of that district during many years both before and after the time I first met with him,

during my second expedition into Central Australia.

I quote Mr. James's statements to me just as I noted them:
"Among the blacks about Blanchewater the boomerang is made for killing game. It is principally thrown among flocks of ducks, pigeons, and water-hens. It is not used often for fighting nor for killing kangaroo. They might use it in a row when short of weapons, and if their adversaries were not more than twenty or thirty yards distant. The blacks did not